NASA SBIR/STTR Technologies

S3.07-8767 - Spacecraft Thermal Control System Not Requiring Power

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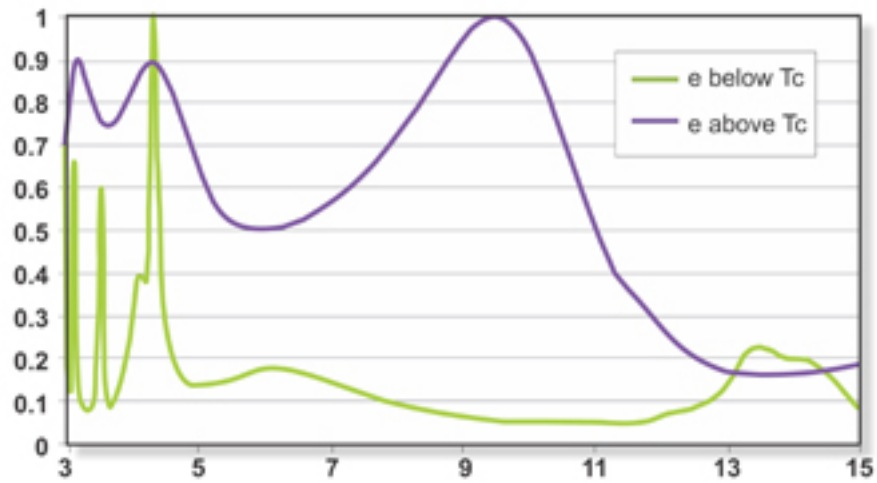
Identification and Significance of Innovation

NASA missions, from CubeSats to conventional satellites to deep space missions, all require thermal management. For this a switchable emissivity surface is desired, but the only established solution, mechanical louvers, is heavy and clumsy. In Phase I, Triton Systems working with a leading research university, demonstrated an innovative coating which switches from low to high emissivity above a set threshold temperature. Feasibility experiments showed the film self-switched from a low emissivity 0.08 to a high peak emissivity 0.97, above a critical temperature - which can be engineered in the range 10-70C as required for a specific application. The coating has no moving parts, is composed of all solid state and stable materials, can be deposited on flexible space qualified polymer substrates, requires no external power or control, and is anticipated to last the mission lifetime with no deterioration or fatigue.



Estimated TRL at beginning and end of contract: (Begin: 3 End: 6)

Technical Objectives and Work Plan

Phase II plans to demonstrate broadened IR spectral coverage, leading to a variable emissivity coating which will be competitive in dynamic thermal performance with mechanical louvers, but less complex and significantly lower in weight. A scale-up path is proposed to be shown for manufacturing of large areas of material and a suite of space-relevant environmental tests are planned to be carried out.

NASA Applications

The film would be applied to the exterior of NASA spacecraft or to electronics modules to regulate temperature.

Non-NASA Applications

Commercial versions of the material can help architects design energy efficient buildings by controlling infrared radiation, would have applications in improved photovoltaics and for industrial process control as a passive thermostat to regulate temperature.

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